



# *Sphagnum squarrosum* Crome, subgenus *Squarrosa* (Russow) Schimp. (Bryophyta: Sphagnaceae), in South America

Denise Pinheiro Costa

Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rua Pacheco Leão 915, 22460-030, Rio de Janeiro, RJ, Brazil. [denisepinheirodacosta@gmail.com](mailto:denisepinheirodacosta@gmail.com)

## Abstract

During a taxonomic review of Sphagnaceae of Brazil, I found 5 collections in herbaria of *Sphagnum squarrosum*, an interesting species because of its typically robust form with strongly squarrose branch leaves that give this species a “spiky” look. These are the first records of this species from Brazil and the first of the subgenus *Squarrosa* from South America. These 5 records represent the southernmost known populations of this species in the Southern Hemisphere. A brief description, a key to the species of subgenus *Squarrosa*, and illustrations are given.

## Key words

Range extension; new records; taxonomy.

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## Introduction

The family Sphagnaceae has a wide world distribution and includes 1 genus, *Sphagnum* L. with about 300 species in 6 monophyletic subgenera. In the Neotropics this family shows greatest diversity, with 6 subgenera represented and about 16 species (Gradstein et al. 2001, Shaw et al. 2010). Tropical America is one of the richest regions of the world for *Sphagnum* diversity, and much of this diversity is in southeastern Brazil and the tropical Andes (Gradstein et al. 2001). In Brazil, where 81 species occur, the genus predominates in the coastal Atlantic Forest region that extends from the northeast to south of the country (Costa 2015). Until now, the subgenus *Squarrosa* (Russow) Schimp. was not known from Brazil or South America. In my study of the family Sphagnaceae in Brazil I found 5 collections of *Sphagnum squarrosum* Crome from São Paulo and Rio Grande do Sul states.

This is a species previously known from Europe, China, Japan, India, Korea, Siberia, New Zealand, Mexico, USA (including Alaska), and Greenland (Crum 1984, Crum and Anderson 1981). Here I provide a brief description and figures of *S. squarrosum* and a key to the species of the subgenus *Squarrosa*.

## Methods

While studying herbaria records of the family Sphagnaceae from Brazil (part of the project “Synopsis of the Sphagnaceae to Brazil”), 5 collections were identified as *S. squarrosum* Crome (1803: 24–25) from southeastern and southern Brazil (see below).

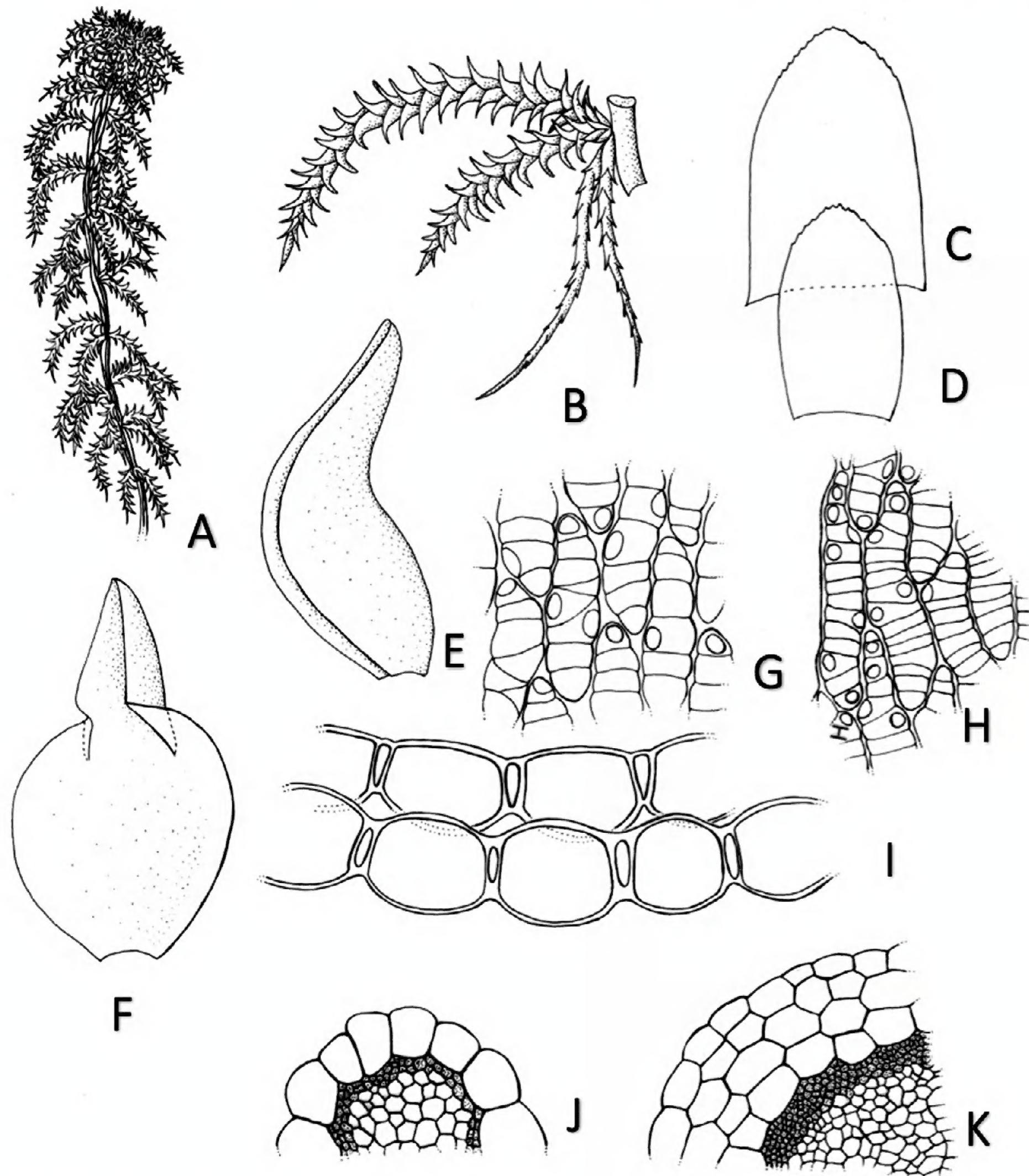
The specimens were photographed in the laboratory and are housed in the herbaria ICN, MBM, PACA, and SP (Thiers 2015). Terminology for morphological structures follows Crum and Anderson (1991). The map was made using ArcMap 9.3.

## Results

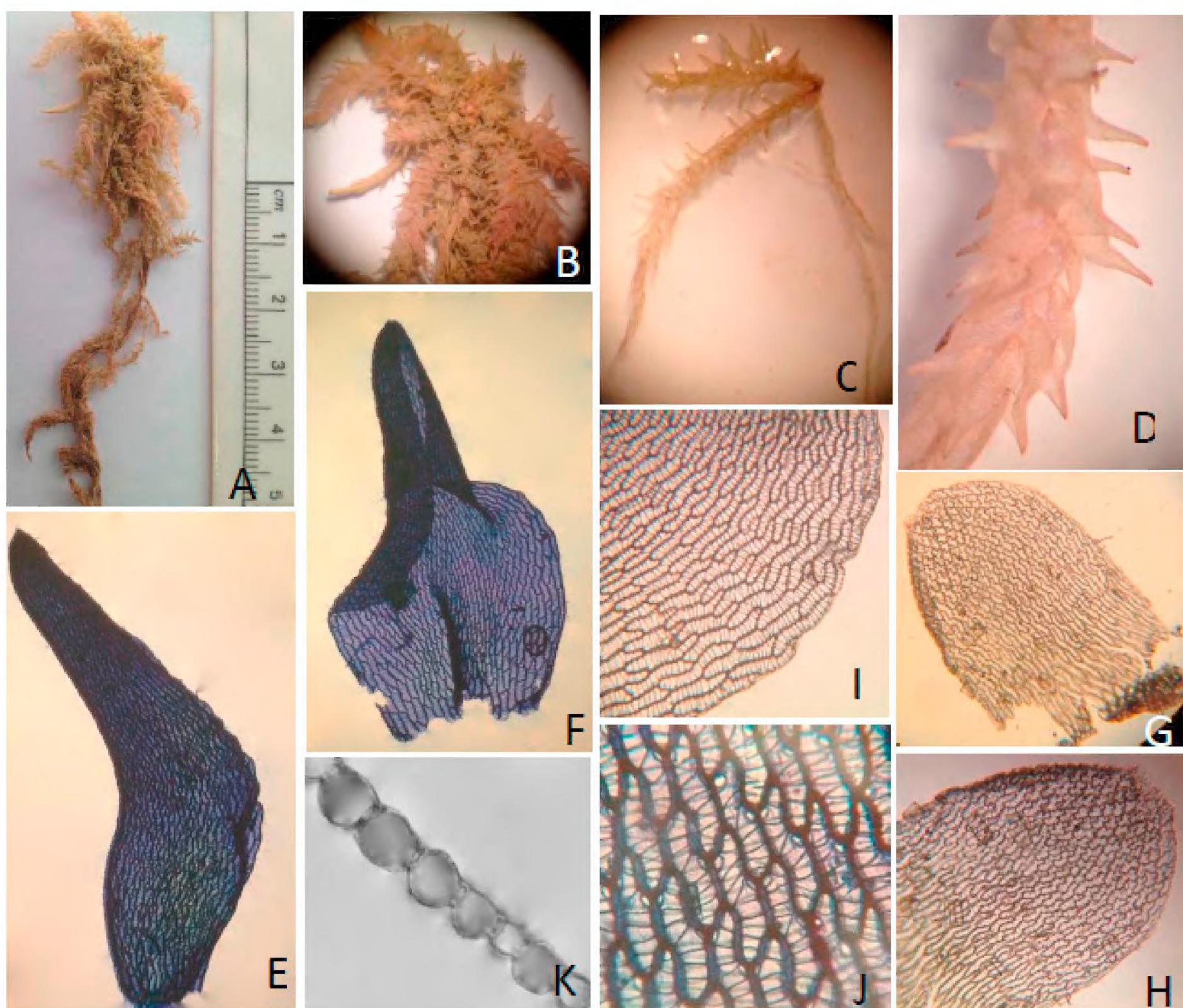
The identification was performed by consulting specialized bibliography (Crum 1980, Crum 1984, Crum and Anderson 1981).

*Sphagnum squarrosum* is a relatively robust plant, growing in loose pale- to yellow-green carpets; with terminal bud large; and cortical cells of stem without fibrils or pores. Stem leaves shorter than branch leaves, slightly concave, large (1.6–1.8 mm long), ovate-lingulate to oblong-lingulate, finely fringed at a rounded apex, bordered or not; leucocysts undivided and without fibrils.

Branches long and tapering with squarrose spreading leaves. Branch fascicle with 4 or 5, 2 spreading and 2 or 3 pendent. Cortical cells in 1 or 2 layers. Branch leaves larger than stem leaves (1.9–3.0 mm long), strongly squarrose, giving its “spiky” look, broadened at base and abruptly contracted at middle to an involute-concave apex, curved away from the branch, bordered by 1–3 rows of linear cells, distinctively curved away from the branch, leucocysts slightly convex on both surfaces, on the inner surface with 1–3 rounded to elliptic pores at ends and non-ringed pores on the outer surface, walls smooth or



**Figure 1.** *Sphagnum squarrosum* Crome. **A.** Habit. **B.** Fascicle. **C, D.** Stem leaves. **E, F.** Branch leaves. **G.** Upper cells of branch leaf, outer surface. **H.** Upper cells of branch leaf, inner surface. **I.** Branch leaf in cross sections. **J.** Portion of branch in cross section. **K.** Portion of stem in cross section (A. Sehnem 334). Illustrations by Maria Alice de Rezende.



**Figure 2.** *Sphagnum squarrosum* Crome. **A.** Habit. **B.** Detail of terminal bud. **C.** Fascicle. **D.** Detail of the branch leaves. **E, F.** Branch leaves. **G, H.** Stem leaves. **I.** Marginal cells of branch leaf. **J.** Median cells of branch leaf, inner surface. **K.** Branch leaf in cross section (A Sehnem 334). Photos by Denise Costa.

slightly papillose. In cross section, leucocysts concave on both surfaces, chlorocysts triangular or trapezoidal, equally exposed on both surfaces or more exposed on the outer surface (Figs 1, 2).

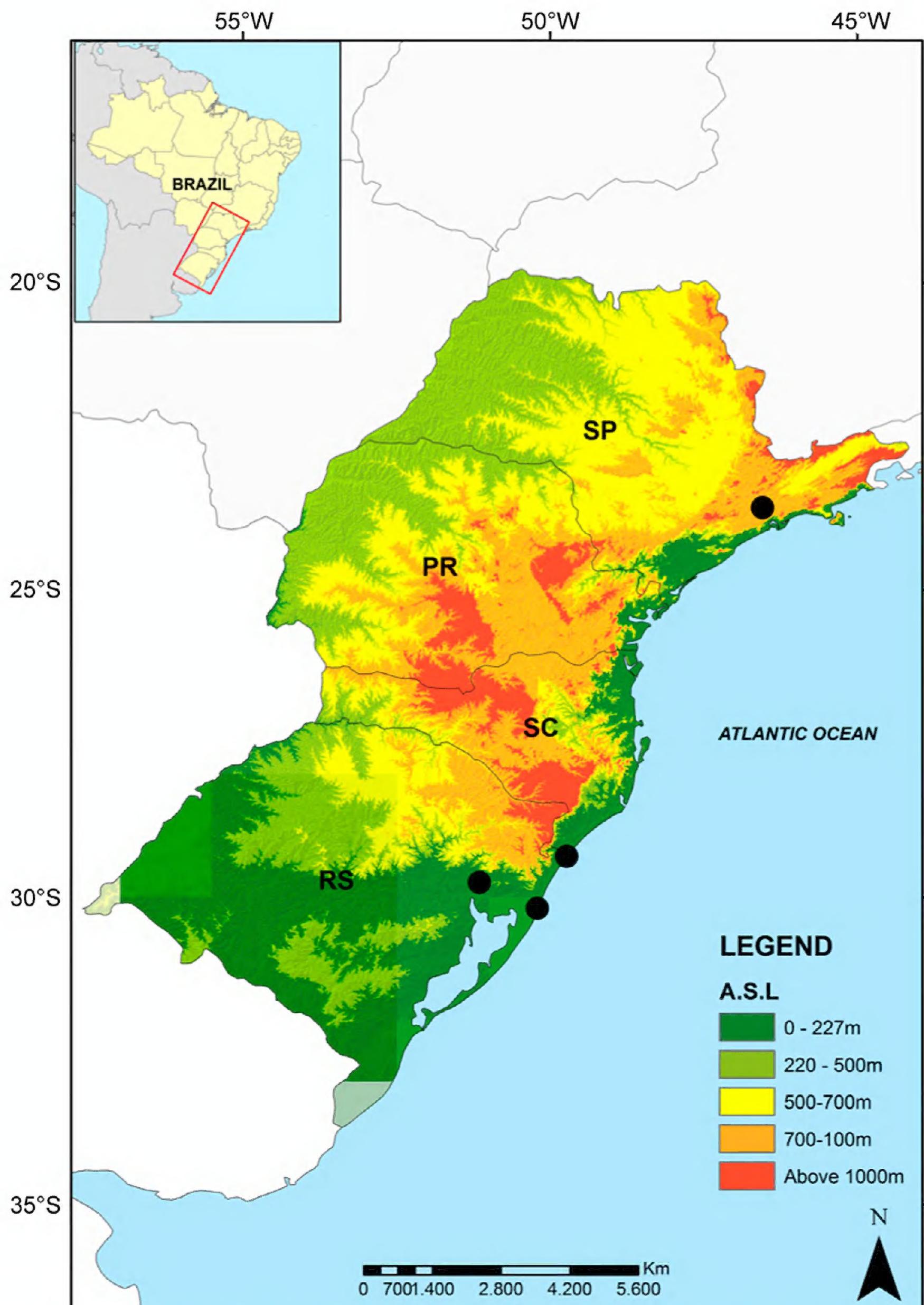
*Sphagnum squarrosum* is unmistakable because has a typical robust form with strongly squarrose branch leaves giving to this species a “spiky” look, growing in loose, pale green to yellowish carpets. Is a circumboreal taxon, widespread throughout the Northern Hemisphere from the sub-arctic to the warm temperate zones of Europe, Asia and North America and the new records reported here fit a disjunction pattern of distribution for this taxon, because the species of this subgenera are typically widespread on temperate zones.

**Materials examined.** Brazil: Rio Grande do Sul. Cidreira, Fazenda Azaléia, Rio Palmares, junto a um grupo de *Blechnum*, [30°10'52" S, 50°12'20" W], 10 m, 1-I-2012, R. Wasum & E. Valduga 4949 (MBM 0385252 as *S. perichaetiale*); São Leopoldo, Portão, *in terram paludosa in locis umbroso*, [29°45'37" S, 51°08'50" W], 50 m, 22-VI-1936, A. Sehnem 334 (PACA 83896); idem, [29°20'07" S,

49°43'37" W], 7-X-1934, A. Sehnem s.n. (PACA 952); Torres, campo úmido a esquerda do último riacho antes da casa do Sr. Clemente, 10-X-1981, R. Bueno 872 (ICN 57652). São Paulo: Santo André, REBIO do Alto da Serra de Paranapiacaba, trilha, 23°39'50" S, 046°32'18" W, 1100 m, no solo úmido da mata atlântica, 8-III-2007, O. Yano & J. Bordin 29404 (SP 388870).

#### Key to the species of *Sphagnum* subgenus *Squarroso*

- 1 Branch leaves with apex broad and truncate. Alaska, Canada, Norway ..... *S. tundrae* Flatb.
- 1' Branch leaves not truncate, abruptly or gradually tapered ..... 2
- 2 Plants robust. Branch leaves strongly squarrose, large, base broadly elliptic and erect, 1.9–3.0 mm long, leucocysts with ringed elliptic pores on the inner surface and unringed pores on the outer surface. Europe, China, Japan, India, Korea, Siberia, New Zealand, Mexico, USA, Greenland to Alaska ..... *S. squarrosum* Crome
- 2' Plants slender. Branch leaves gradually tapered, erect or spreading at apex, 1.0–1.3 mm long, leucocysts with



**Figure 3.** Map of Brazil showing the distribution of *Sphagnum squarrosum*. Solid black circles: new records. SP = São Paulo State, PR = Paraná State, SC = Santa Catarina State, RS = Rio Grande do Sul State (source: Center for Scientific Computing/JBRJ).

unringed elliptic pores on both surfaces (inner and outer)..... 3  
 3 Leucocysts of branch leaves near base on the inner surface without pores and with large pores on the outer surface. Alaska..... *S. mirum* Flatberg & Thingsgaard

3' Leucocysts of branch leaves near base on the inner surface with large, round pores, and without pores on the outer surface. Canada, Alaska, USA, Greenland, Eurasia..... *S. teres* (Schimp.) Ångstr. ex Hartm.

## Discussion

According to Crum (1980, 1984) and Crum and Anderson (1981), *S. squarrosum* is circumpolar in the Northern Hemisphere and common in northern temperate latitudes (North America from the Arctic to New York) where it grows in woodlands that are subject to seasonal flooding, swamps, and stream margins. In montane regions, it occurs on wet rock ledges (e.g. Mexico and North Carolina). It is widespread across all Europe, China, Japan, India, Korea, Siberia, and New Zealand, Mexico, and Greenland to Alaska. In Brazil *S. squarrosum* is now known from the Southeastern Region, in the Atlantic Forest of São Paulo state, and in the Southern Region, in the steppe of Rio Grande do Sul state, where it occurs on humid soil near creeks, from sea level to 1100 m. These are the first records of this species from Brazil and South America (Fig. 3), and the discovery of *S. squarrosum* in Brazil meaningfully extends range of this species south by thousands of kilometers. This species is believed to be rare and restricted in Brazil to the southern part of the country (Fig. 3).

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